

CLAIMS

What is Claimed is:

5 1. An impulse therapy garment for use in pump therapy for enhancing venous and arterial blood flow, the garment comprising:

 a fabric comprising a length sufficient to wrap around an arch and dorsum of a foot along a path perpendicular to a length of the foot, and comprising a width substantially coextensive with a span between the ball and heel of the foot;

10 an inflatable bladder coupled to the fabric and configured to press against the arch of the foot when inflated, the inflation further configured to direct a force against the dorsum of the foot; and

 a heel strap configured to be positioned around the back of the heel, and having a first end pivotally coupled proximate to the fabric at a first location when the fabric is
15 wrapped around the foot and a second end coupled proximate to the outer surface of the fabric at a second location.

2. A garment according to claim 1, wherein the first end of the heel strap is pivotally coupled about a stem of an inflation port coupled to the bladder and configured to pass air
20 into the bladder.

3. A garment according to claim 2, wherein the first end comprises a hole therethrough configured to receive a stem of the inflation port.

4. A garment according to claim 3, wherein the stem comprises port protrusions about its external surface for engaging with a stop protrusion located on an inside diameter of the hole, the port protrusions and the stop protrusion engaging to limit the pivot of the first end about the stem.

5. A garment according to claim 3, wherein the first end further comprises a reinforcement area surrounding the hole.

6. A garment according to claim 1, wherein the heel strap is configured to pivot up to about 180° with respect to the fabric, the garment configurable for use on a left or right foot based on the 180° pivot.

7. A garment according to claim 1, wherein the heel strap is configured to pivot up to about 45° with respect to the fabric to provide vertical adjustment along the back of the heel.

8. A garment according to claim 1, wherein the second end of the heel strap is removeably coupled to the outer surface of the fabric using a hook-and-loop fastener, wherein a hook portion of the fastener is on the second end and a loop portion of the fastener is on the outer surface of the fabric.

9. A garment according to claim 1, further comprising a resilient shank member having a length substantially coextensive with the width of the fabric and a width substantially coextensive with a width of the foot, the shank member coupled to the fabric at a location sufficient to substantially lap the span.

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10. A garment according to claim 9, wherein the shank member is an inner shank, the garment further comprising an outer shank located over an outer surface of the fabric opposite the inner shank, and having a length and a width coextensive with the length and width of the inner shank.

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11. A garment according to claim 9, wherein the bladder comprises a width substantially coextensive with the length of the shank member and a length extending along a portion of the length of the fabric across the width of the shank member to an end of the fabric.

15 12. A garment according to claim 1, wherein the fabric further comprises at least one dorsum strap extending along the length of the fabric from an end thereof and configured to removeably attach to an outer surface of the fabric for securing the garment around the foot.

13. An impulse therapy garment for use in pump therapy for enhancing venous and
20 arterial blood flow of a human foot, the garment comprising:

a fabric comprising a length sufficient to wrap around an arch and dorsum of a foot along a path perpendicular to a length of the foot, and comprising a width substantially

coextensive with a span between the ball and heel of the foot;

an inflatable bladder coupled to the fabric and configured to press against the arch of the foot when inflated, the inflation further configured to direct a force against the dorsum of the foot; and

5 a bladder retention fastener configured to retain an end of the bladder to the fabric to allow substantially differential movement between the fabric and non-retained portions of the bladder during inflation and deflation of the bladder.

14. A garment according to claim 13, wherein the fastener comprises a flexible clip
10 having opposing coupling means on opposing ends thereof, one coupling means coupled to the end of the bladder and the other coupling means coupled to a skin-side surface of the fabric, the flexible clip flexing during inflation and deflation of the bladder.

15. A garment according to claim 13, wherein the bladder retention means comprises a
15 resilient bladder layer formed along at least one side of the bladder and configured to resist folding.

16. A garment according to claim 15, wherein the resilient bladder layer comprises a
20 foam layer.

17. A garment according to claim 13, wherein the bladder retention means comprises a fastener having a receptacle and a plug, the receptacle configured to receive the plug therein,

and wherein one of the plug or receptacle is associated with the bladder and the other is associated with the fabric.

18. A garment according to claim 13, further comprising a resilient shank member
5 having a length substantially coextensive with the width of the fabric and a width substantially coextensive with a width of the foot, the shank member coupled to the fabric at a location sufficient to substantially lap the span.

19. A garment according to claim 18, wherein the bladder comprises a width
10 substantially coextensive with the length of the shank member and a length extending along a portion of the length of the fabric across the width of the shank member to an end of the fabric.

20. A garment according to claim 13, further comprising a heel strap configured to be
15 positioned around a back of the foot and having opposing ends of the heel strap coupled proximate to the outer surface of the fabric at respective locations when the fabric is wrapped around the foot.

21. An impulse therapy garment for use in pump therapy for enhancing venous and
20 arterial blood flow of a human foot, the garment comprising:
a fabric comprising a length sufficient to wrap around an arch and dorsum of a foot along a path perpendicular to a length of the foot, and comprising a width substantially

coextensive with a span between the ball and heel of the foot;

an inflatable bladder coupled to the fabric and configured to press against the arch of the foot when inflated, the inflation further configured to direct a force against the dorsum of the foot; and

5 an air connector hermetically coupled over a stem of an inflation port, wherein the port is coupled to the bladder and configured to pass air to and from the bladder, the air connector configured to rotate about the stem to orient a hose opening located on a side of the air connector substantially perpendicular to a length of the stem.

10 22. A garment according to claim 21, the air connector comprising an inner bore surface locatable around the stem and further comprising a protrusion feature on the inner bore surface, the stem having an annular port stop feature about its external surface configured to receive the protrusion feature therebetween to provide positive stops for the rotation of the air connector about the stem.

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23. A garment according to claim 21, the air connector further comprising an annular groove on an inner bore surface locatable around the stem, and the stem further comprising an annular protrusion about its external surface configured to receive the annular protrusion when the air connector is located over the stem, the engagement of the annular protrusion
20 within the annular groove coupling the air connector to the port while allowing rotation of the air connector about the stem.

24. A garment according to claim 21, wherein the air connector is configured to rotate 360° about the stem.
25. A garment according to claim 21, wherein the fabric is forcibly retained between the
5 air connector and a flange portion of the port when the air connector is hermetically coupled over the stem.
26. A garment according to claim 21, wherein the stem of the port comprises an annular lip seal on an end thereof adapted to hermetically engage an inner bore surface of the air
10 connector when the air connector is hermetically coupled over the stem, the engagement of the annular lip seal and the inner bore surface providing a seal between the air connector and the port while allowing rotation of the air connector about the stem.
27. A garment according to claim 21, wherein an internal gallery of the air connector
15 comprises smooth surface curvatures throughout.
28. A garment according to claim 21, further comprising a resilient shank member having a length substantially coextensive with the width of the fabric and a width substantially coextensive with a width of the foot, the shank member coupled to the fabric at
20 a location sufficient to substantially lap the span.

29. A garment according to claim 28, wherein the bladder comprises a width substantially coextensive with the length of the shank member and a length extending along a portion of the length of the fabric across the width of the shank member to an end of the fabric.

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30. A garment according to claim 21, further comprising a heel strap configured to be positioned around a back of the foot, wherein at least one end of the heel strap is pivotally coupled between the air connector and inflation port about the stem and configured to rotate about the stem independent of the rotation of the air connector.

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31. An impulse therapy garment for use in pump therapy for enhancing venous and arterial blood flow, the garment comprising:

a fabric comprising a length sufficient to wrap around an arch and dorsum of a foot along a path perpendicular to a length of the foot, and comprising a width substantially

15 coextensive with a span between the ball and heel of the foot;

an inflatable bladder coupled to the fabric and configured to press against the arch of the foot when inflated, the inflation further configured to direct a force against the dorsum of the foot; and

a plurality of dorsum straps extending from one end of the fabric, each of the
20 plurality configured to removeably attach to an outer surface of the fabric in independent locations to provide differential adjustment when securing the garment around the foot.

32. A garment according to claim 31, wherein fastening ends of the dorsum straps are removeably coupled to the outer surface of the fabric using hook-and-loop fasteners, wherein hook portions are on the fastening ends and loop portions are on the outer surface of the fabric.

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33. A garment according to claim 31, wherein the plurality of dorsum straps comprises two dorsum straps.

34. A garment according to claim 31, further comprising a heel strap configured to be positioned around a back of the foot and having opposing ends of the heel strap coupled proximate to the outer surface of the fabric at respective locations when the fabric is wrapped around the foot.

35. A garment according to claim 31, further comprising a resilient shank member having a length substantially coextensive with the width of the fabric and a width substantially coextensive with a width of the foot, the shank member coupled to the fabric at a location sufficient to substantially lap the span.

36. A garment according to claim 35, wherein the shank member is an inner shank, the garment further comprising an outer shank located over an outer surface of the fabric opposite the inner shank, and having a length and a width coextensive with the length and width of the inner shank.

37. A garment according to claim 35, wherein the bladder comprises a width substantially coextensive with the length of the shank member and a length extending along a portion of the length of the fabric across the width of the shank member to an end of the fabric.

38. An impulse therapy garment for use in pump therapy for enhancing venous and arterial blood flow, the garment comprising:
a fabric comprising a length sufficient to wrap around an arch and dorsum of a foot along a path perpendicular to a length of the foot, and comprising a width substantially coextensive with a span between the ball and heel of the foot;

an inflatable bladder coupled to the fabric and configured to press against the arch of the foot when inflated, the inflation further configured to direct a force against the dorsum of the foot, the bladder further having a port hermetically coupled thereto for passing air to and from the bladder via a stem; and

a washer having a center hole locatable around the stem and configured to be forcibly retained against the outer surface of the fabric by snap-fit using annular stem protrusions extending from an external surface of the stem.

39. A garment according to claim 38, wherein the washer is forcibly retained against the outer surface of the fabric by snap-fit of the washer beneath the annular stem protrusions, a diameter of the stem protrusions being slightly larger than a diameter of the center hole.

40. A garment according to claim 38, wherein the washer further comprises annular grooves within an inside diameter of the center hole, the washer forcibly retained against the outer surface of the fabric by snap-fit of the annular stem protrusions within the annular grooves.

41. A garment according to claim 38, wherein a mating surface of a flange portion of the port facing the fabric comprises at least one radial rib protruding therefrom and configured to prevent rotational movement of the bladder about the stem and with respect to the fabric.

42. A garment according to claim 38, wherein a mating surface of a flange portion of the port facing the fabric comprises at least one concentric annular groove and a mating surface of the washer facing the fabric comprises at least one concentric annular protrusion corresponding to the at least one annular groove, the at least one concentric annular protrusion and at least one annular groove configured to entrap the fabric and the retained portion of the bladder therebetween to retain the bladder and to provide a seal between the port and the bladder.

43. A garment according to claim 38, further comprising a resilient shank member having a length substantially coextensive with the width of the fabric and a width

substantially coextensive with a width of the foot, the shank member coupled to the fabric at a location sufficient to substantially lap the span.

44. A garment according to claim 43, wherein the bladder comprises a width
5 substantially coextensive with the length of the shank member and a length extending along a portion of the length of the fabric across the width of the shank member to an end of the fabric.

45. A garment according to claim 43, wherein the shank member is an inner shank, the
10 garment further comprising an outer shank located over an outer surface of the fabric opposite the inner shank, and having a length and a width coextensive with the length and width of the inner shank.

46. A garment according to claim 45, wherein the washer is coupled to the outer shank
15 member using a neck.

47. A garment according to claim 38, further comprising a heel strap configured to be
positioned around a back of the foot and having opposing ends of the heel strap coupled
proximate to the outer surface of the fabric at respective locations when the fabric is
20 wrapped around the foot.

48. A hose-clamp system for securing a hose to an air connector, the system comprising:
a fitting having an internal stem and an external stem, the internal stem having a
predetermined length and an outer diameter configured to hermetically engage an inside
diameter of an end of the hose to the predetermined length;

5 a cradle configured to received the internal stem and the end of the hose, the cradle
comprising:

opposing locking protrusions within the cradle and radially extending
towards a center of the cradle, a top of each locking protrusion spaced from a top of
another by less than the outer diameter of the hose, and

10 a seal positioned from the locking protrusions at substantially the length of
the internal stem and configured to hermetically engage the external stem, the
locking protrusions configured to crimp the outside diameter of the hose at an end of
the internal stem opposite the external stem when the external stem is received by the
seal and the hose and internal stem are received within the cradle.

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49. A hose-clamp system according to claim 48, wherein the opposing locking
protrusions comprise two opposing locking protrusions configured to crimp the hose on
opposing sides of the hose.

20 50. A hose-clamp system according to claim 48, wherein the internal stem comprises
annular serrated protrusions extending from an outside diameter thereof and adapted to
positively engage the inside diameter of the hose.

51. A hose-clamp system according to claim 48, wherein the seal comprises a hole formed therethrough having a diameter less than an outer diameter of the external stem.

52. A hose-clamp system according to claim 48, wherein the seal comprises rubber.

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53. A hose-clamp system according to claim 48, wherein the cradle is a portion of an air connector configured to hermetically engage an inflation port of a garment for use in pump therapy for enhancing venous and arterial blood flow of a human foot, the hose providing air to the port.

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